

## MONITORING PLAN

### PROJECT NO. C/S-18 SABINE REFUGE PROTECTION

**ORIGINAL DATE: August 30, 1995**

**REVISED DATE: July 23, 1998**

#### Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was reduced in scope due to budgetary constraints. Specifically, post-construction aerial photography was reduced from twice to once; and shoreline monitoring was reduced from every three years to four times post-construction.

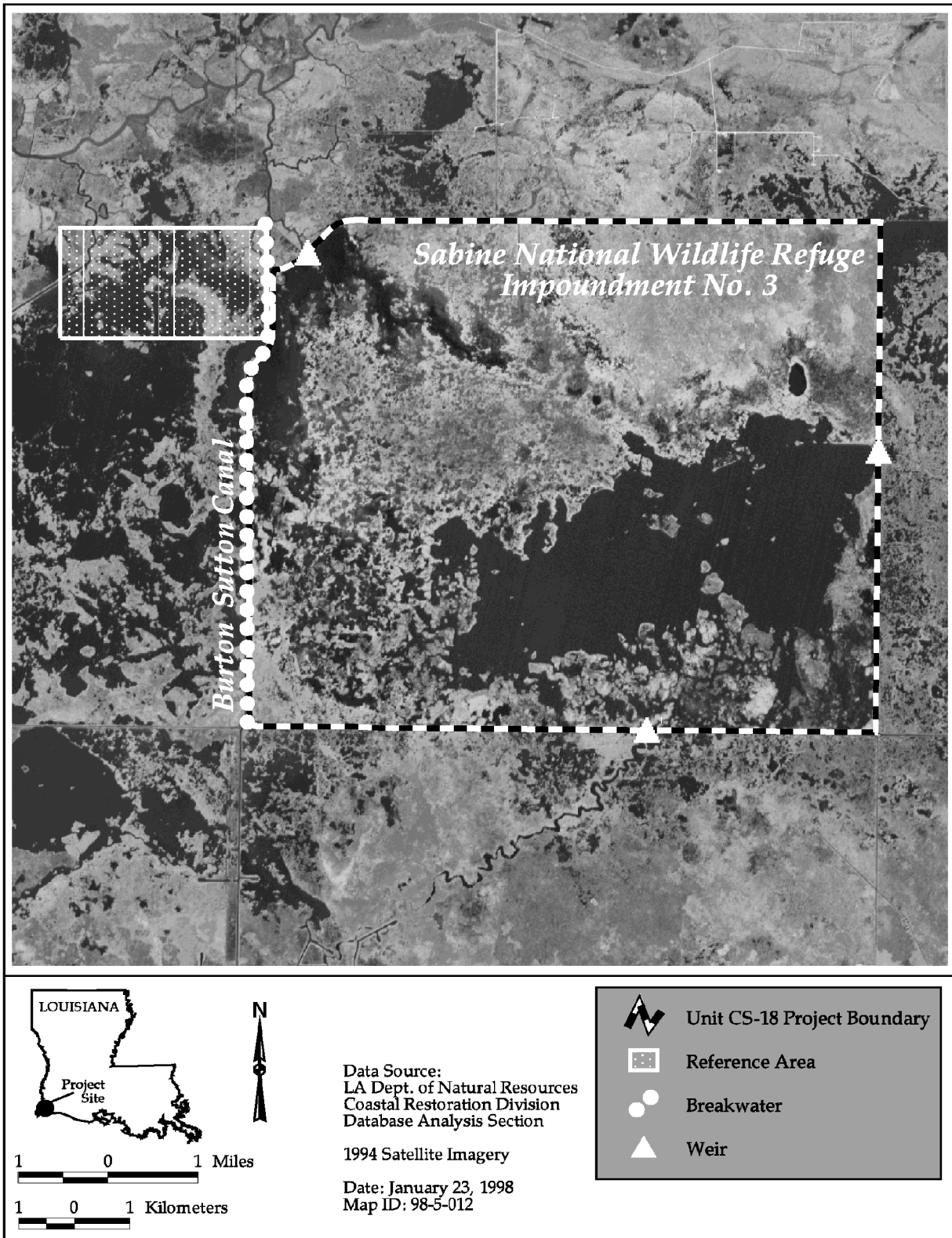
#### Project Description

The proposed project is located approximately 20 mi (32 km) west-southwest of Hackberry, Louisiana (figure 1) on the east levee of the Burton-Sutton Canal (BSC) adjacent to the Sabine National Wildlife Refuge Impoundment 3, a 27,000 ac (10,927 ha) freshwater impoundment that provides habitat for freshwater game fish, alligator, furbearers, and migratory and resident waterfowl. The existing west levee along Impoundment 3, which was constructed in 1951, has deteriorated due to boat wake erosion and subsequent sloughing of levee material into the BSC. It is estimated that the levee is eroding at the rate of 0.27 ft/yr (0.08 m/yr) (LCWCRTF 1991; USFWS 1991). Continued erosion will result in multiple breaches of the levee, allowing higher salinity waters from the Calcasieu Ship Channel and Sabine Lake to enter the impoundment via the BSC. Since much of the freshwater marsh within the impoundment is highly organic and floating, saltwater intrusion and increased tidal exchange would likely convert as much as 13,000 ac (5,261 ha) of the impoundment to shallow open water (LCWCRTF 1991; USFWS 1991). The loss of floating and submersed vegetation would result in greater wind-induced wave erosion of the remaining marsh within the impoundment.

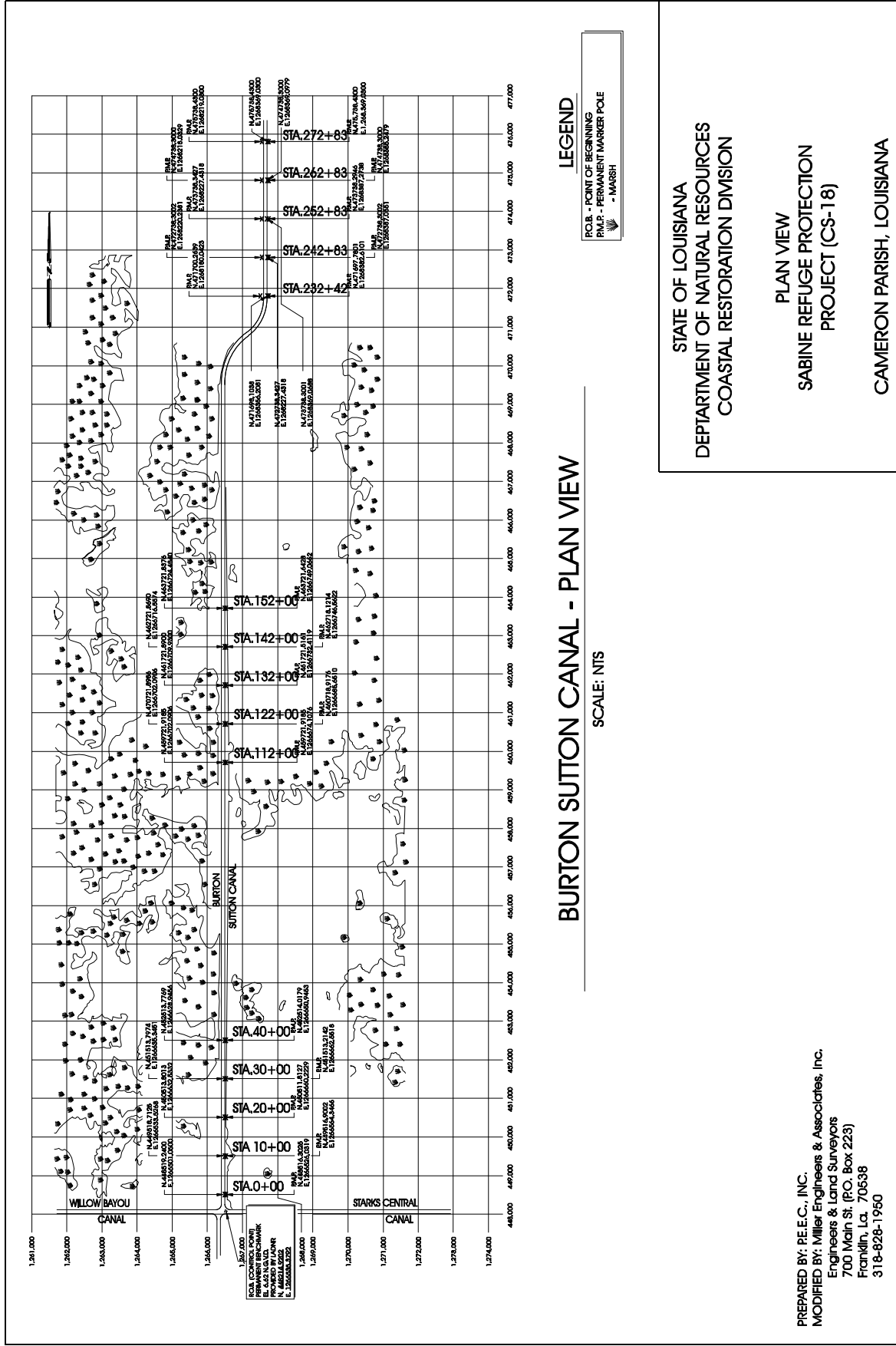
Salinity is not monitored regularly in the project area. However, according to Sabine NWR personnel, salinity in the canal has been recorded at 14.7 ppt while Impoundment 3 salinity is believed to be stable at #1.0 ppt. The presence of freshwater vegetation such as *Zizaniopsis aquatica* (giant cutgrass) and *Nelumbo lutea* (American lotus) within the impoundment indicate that salinities are typically very low. Water level within the impoundment is maintained at a pool stage of approximately 2 ft (0.6 m) using three 90 ft (27 m) long variable crest weirs.

Since 1991, several conceptual plans and status reports dealing with this restoration project have appeared (LCWCRTF 1991, 1993; LDNR 1992, 1993; USFWS 1991), leading to the project on hand.

To prevent further bank erosion, 5.5 mi (8.9 km) of free-standing rock breakwater will be constructed on the canal side of the east levee of the BSC (figure 2). In addition, the levee will be restored where it is degraded using dredge material from the canal, and maintenance work will be



**Figure 1.** Sabine Refuge Protection (C/S-18) project area map.



**Figure 2.** Plan view of the Sabine Refuge Protection (C/S-18) project rock dike along the Burton-Sutton Canal showing the location of the survey cross sections established to monitor shoreline movement.

undertaken at the three weir sites and at three alligator crossings. A similar project, Cameron Prairie Refuge Protection (ME-9), will also utilized a rock breakwater to prevent bank erosion along the Gulf Intracoastal Waterway (GIWW).

### Project Objectives

1. Protect the existing freshwater vegetation within Impoundment 3 of Sabine NWR adjacent to the Burton-Sutton Canal.
2. Prevent the encroachment of the Burton-Sutton Canal into the impoundment.

### Specific Goals

The following measurable goals were established to evaluate project effectiveness:

1. Restore and protect the west levee of Impoundment 3 using dredge material and a free-standing rock breakwater.
2. Protect existing freshwater vegetation in Impoundment 3 from saltwater intrusion via the Burton-Sutton Canal.

### Reference Area

In order to evaluate project success over time, a reference area, consisting of 1 mile of shoreline along the west bank of the BSC opposite from the northernmost mile of the rock dike along the east bank, will be monitored concurrently with the project area shoreline. Data collected will be used to make statistically valid comparisons of what the shoreline erosion rate, marsh loss rate, etc. would be with and without the project, by comparing data obtained from the project and reference areas. The main criteria for selecting this particular reference area are its similarity to the project area shoreline in terms of vegetative community, soil type, and hydrology.

### Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. **Aerial Photography** To measure vegetated and non-vegetated areas within the project area (to include near-vertical color infrared aerial photography at 1:12,000 maximum scale, and control markers). Aerial photography will be georectified by National Wetlands Research Center (NWRC) personnel using standard operating procedures described in Steyer et al. (1995). The NWRC photography will be obtained prior to construction in 1993, and in 1996.

2.      **Shoreline Change**      To document shoreline movement, shoreline markers will be placed on the vegetated marsh edge along the east bank of the BSC (and in a reference area along the west bank of the BSC, opposite the northernmost mile of the rock dike) adjacent to the northernmost, central, and southernmost miles of the rock dike, at 1,000 ft(305 m) intervals. Shoreline position relative to the shoreline markers will be documented by direct measurement in 1995 (pre-construction), then in years 2000, 2005, 2010, and 2014. Aerial photography and GPS measurements will also be used to document shoreline movement.

### Anticipated Statistical Analyses and Hypotheses

The following hypothesis corresponds with the monitoring elements and will be used to evaluate the accomplishment of the project goals.

- 1, 2.    Paired t-tests, Analysis of Variance (ANOVA), and descriptive and summary statistics will be used to compare measured rates of shoreline movement in the project area with a reference area. Also, historical values for the area as well as data available from other surveys (USACE, USFWS, LDNR, LSU) will be gathered to document and allow for statistical analysis of long-term shoreline movement along the Burton-Sutton Canal in the project area. When the  $H_0$  is not rejected, the possibility of negative effects will be examined.

*Goal:*    Decrease the rate of shoreline erosion along the east bank of the Burton-Sutton Canal adjacent to Sabine National Wildlife Refuge Impoundment 3.

#### *Hypothesis:*

$H_0$ :      Shoreline erosion rate postconstruction will not be significantly less than shoreline erosion rates in previous years.

$H_a$ :      Shoreline erosion rate postconstruction will be significantly less than shoreline erosion rates in previous years.

**NOTE:**      To aid in determining overall project success, available ecological data, both descriptive and quantitative, will be evaluated in concert with the statistical analyses. This includes ancillary data collected in this monitoring project but not used directly in statistical analyses, as well as data available from other sources (USACE, USFWS, LDNR, LSU, etc.).

## Notes

1.     Implementation:                      Start Construction:                      December 1, 1994  
  End Construction:                      January 27, 1995
2.     USFWS Point of Contact:     Paul Yakupzack                      (318) 598-2216.
3.     DNR Project Manager:            Melvin Guidry                      (318) 893-7947  
       DNR Monitoring Manager:       David Castellanos                  (318) 893-3352  
       DNR DAS Assistant:             Mary Horton                      (504) 342-4122
4.     The twenty year monitoring plan development and implementation budget for this project is \$97,382. Progress reports will be available in September 1995, January 1996, July 1996, and January 1997, and comprehensive reports will be available in January 1998, January 2001, January 2006, January 2011, and January 2015. These reports will describe the status and effectiveness of the project.
5.     USFWS refuge personnel will assist LDNR with monitoring responsibilities.
6.     Refurbished alligator crossings and weir wing-wall areas will be periodically inspected by USFWS/LDNR personnel to ensure the levee in these areas remains intact.
7.     Vegetation changes as documented through ground truthing of aerial photography will be used as an indicator of long-term salinity changes within the project area.
8.     References:

Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF) 1991. Coastal Wetlands Planning, Protection, and Restoration Act, first priority project list report. Appendix E, Tab F. Baton Rouge: Louisiana Coastal Wetlands Conservation and Restoration Task Force. 13 pp.

\_\_\_\_\_ 1993. Coastal Wetlands Planning, Protection, and Restoration Act, Louisiana Coastal Wetlands Restoration Plan, Calcasieu/Sabine Basin, Appendix I. Baton Rouge: Louisiana Coastal Wetlands Conservation and Restoration Task Force. Pp. 88-89.

Louisiana Department of Natural Resources. 1992. Coastal Wetlands Conservation and Restoration Plan for fiscal year 1992–1993. Baton Rouge: Coastal Restoration Division. Pp. 5, A2, B70-B71.

\_\_\_\_\_ 1993. Status report for Coastal Wetlands Conservation and Restoration Plan, fiscal year 1990–1991. Baton Rouge: Coastal Restoration Division. Pp. 273-74.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swensen 1995. Quality management plan for coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

U.S. Fish & Wildlife Service (USFWS). 1991. Reconstruction of the [Sabine National Wildlife Refuge] Impoundment 3 west levee. Proposed project information sheet [for wetland value assessment]. Lafayette, Louisiana: U.S. Fish & Wildlife Service. 4 pp.

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